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FIG. 1

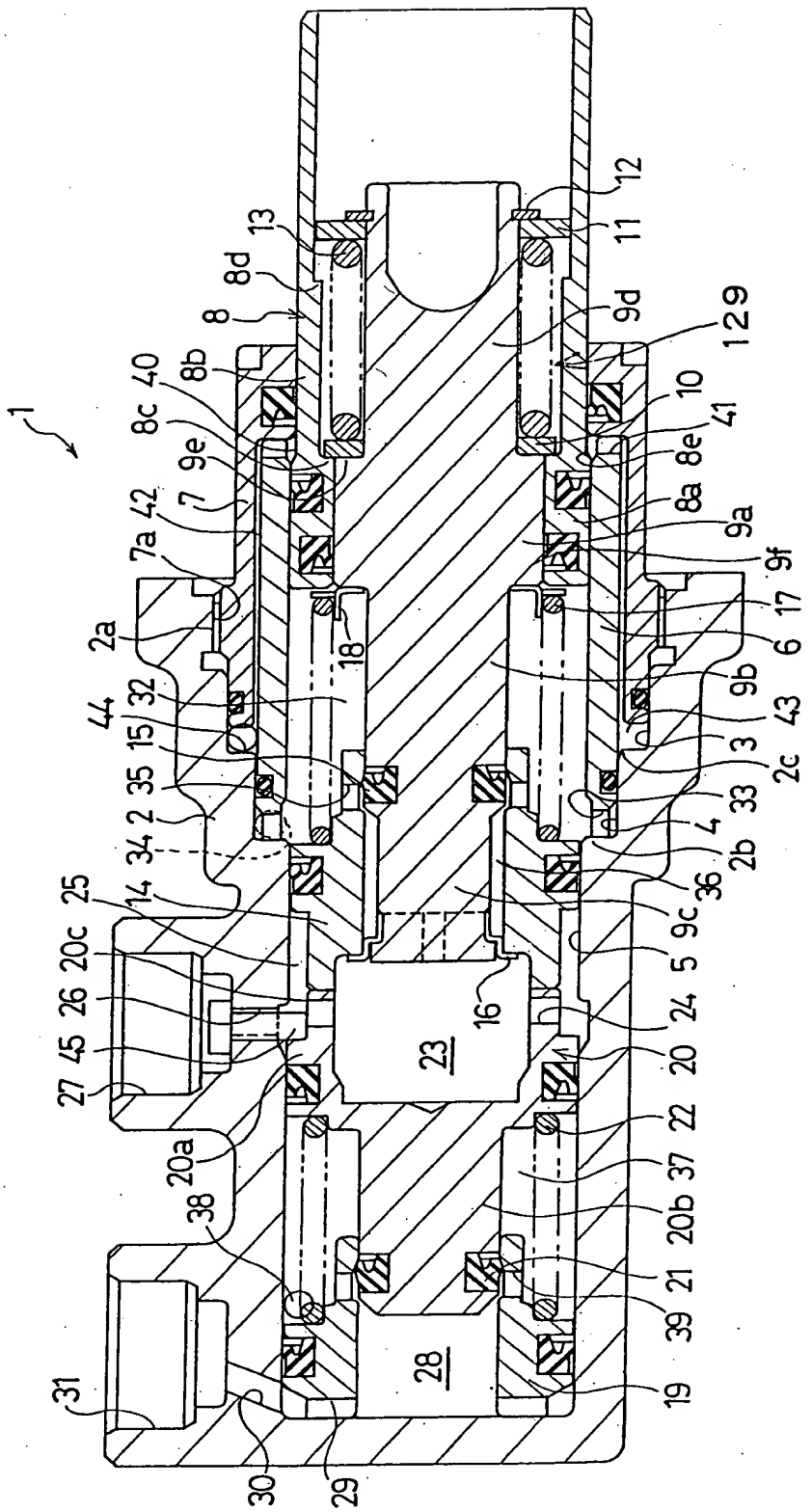

FIG. 2

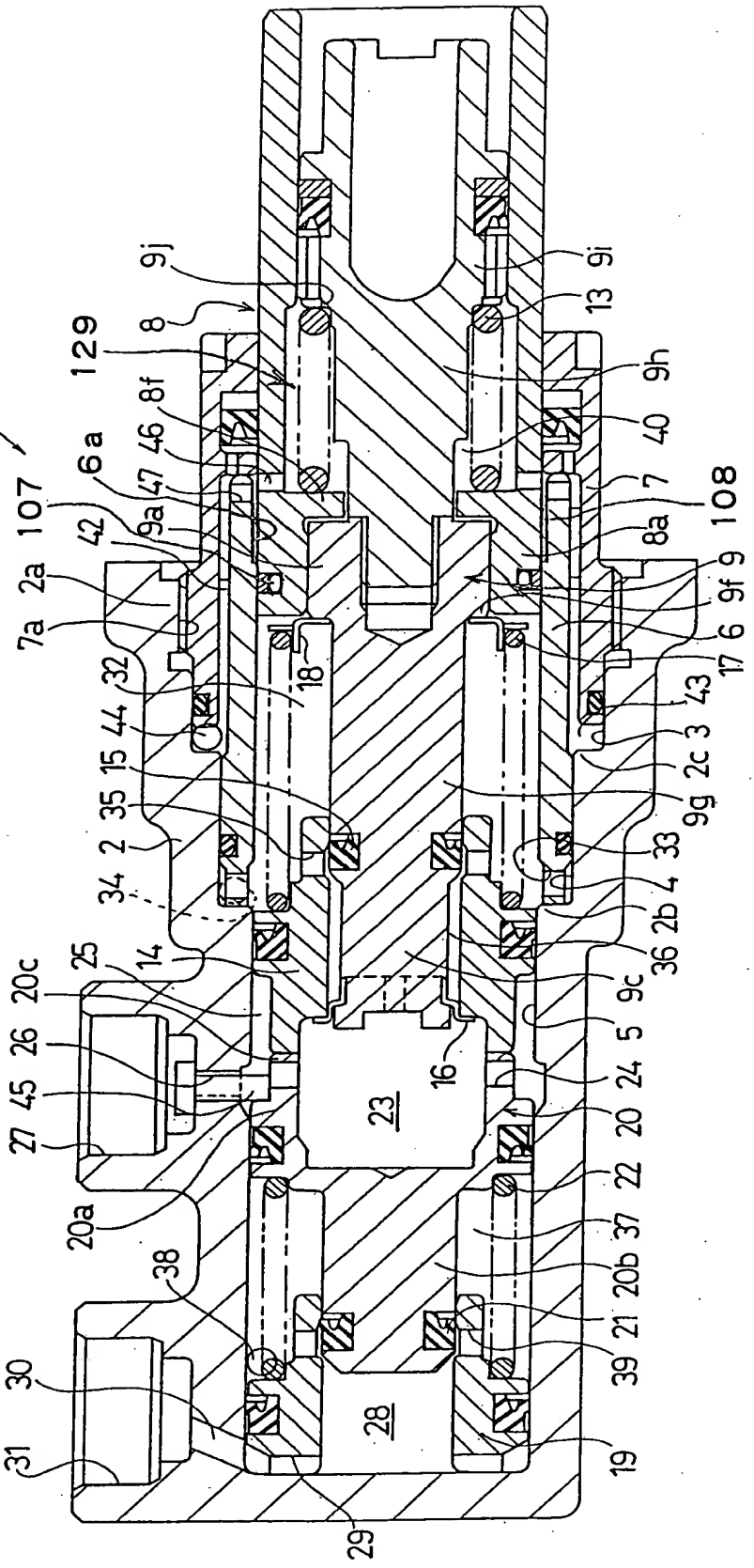
1
129
8
9j
9i
13
8f
9h
46
40
6a
47
7
107
42
9a
8a
108
2a
9f
7a
9
6
32
18
17
44
43
15
3
35
2c
2
9g
34
33
4
2b
14
36
25
9c
20c
5
26
16
24
45
23
20
27
22
20a
37
38
20b
21
30
39
28
31
19
29

FIG. 3

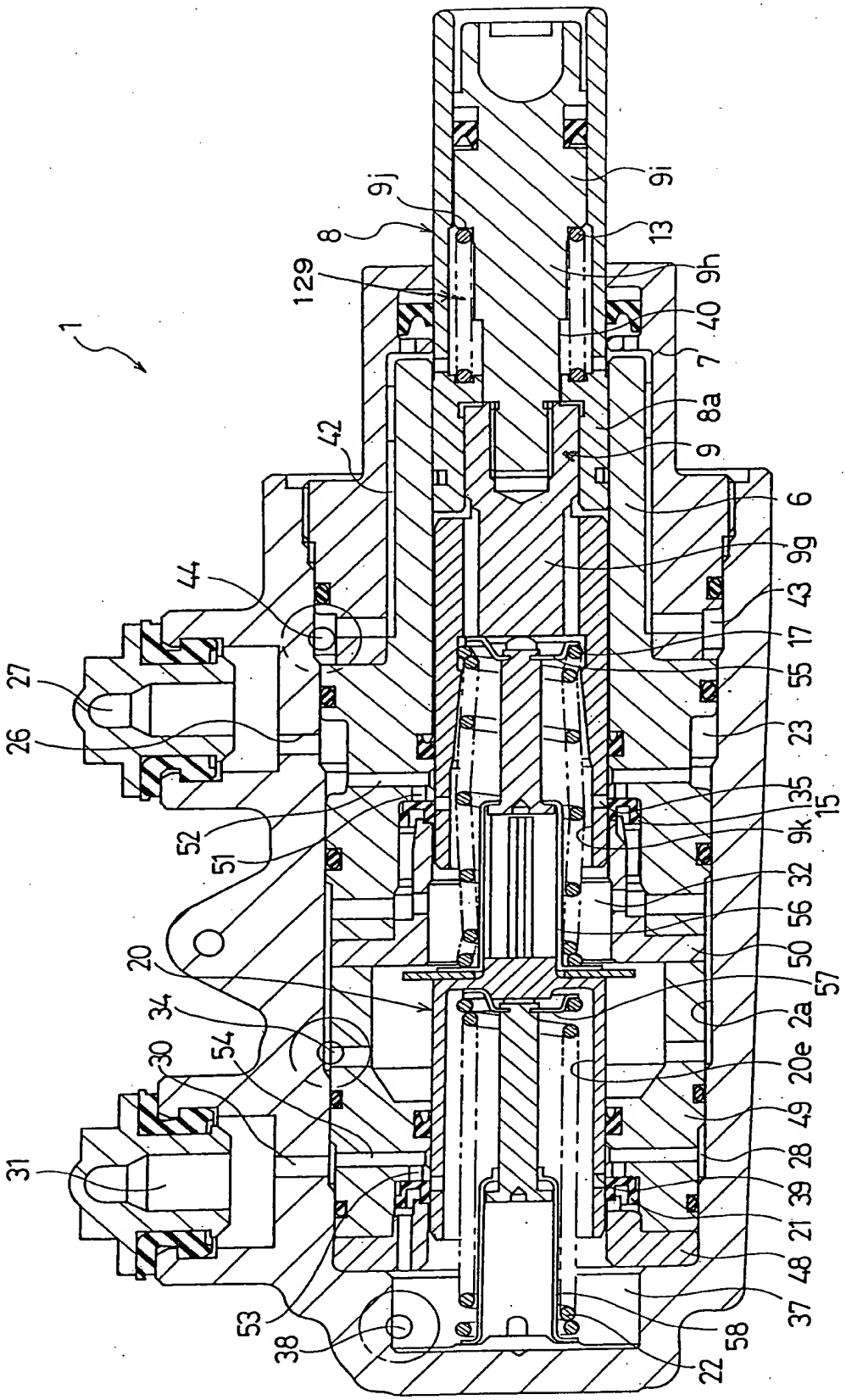
1
9j
8
129
42
44
27
26
52
51
20
34
54
30
31
53
38
9i
13
9h
40
7
8a
9
6
9g
43
17
55
23
35
15
9k
32
56
50
57
2a
20e
49
28
39
21
48
37
58
22

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FIG. 4

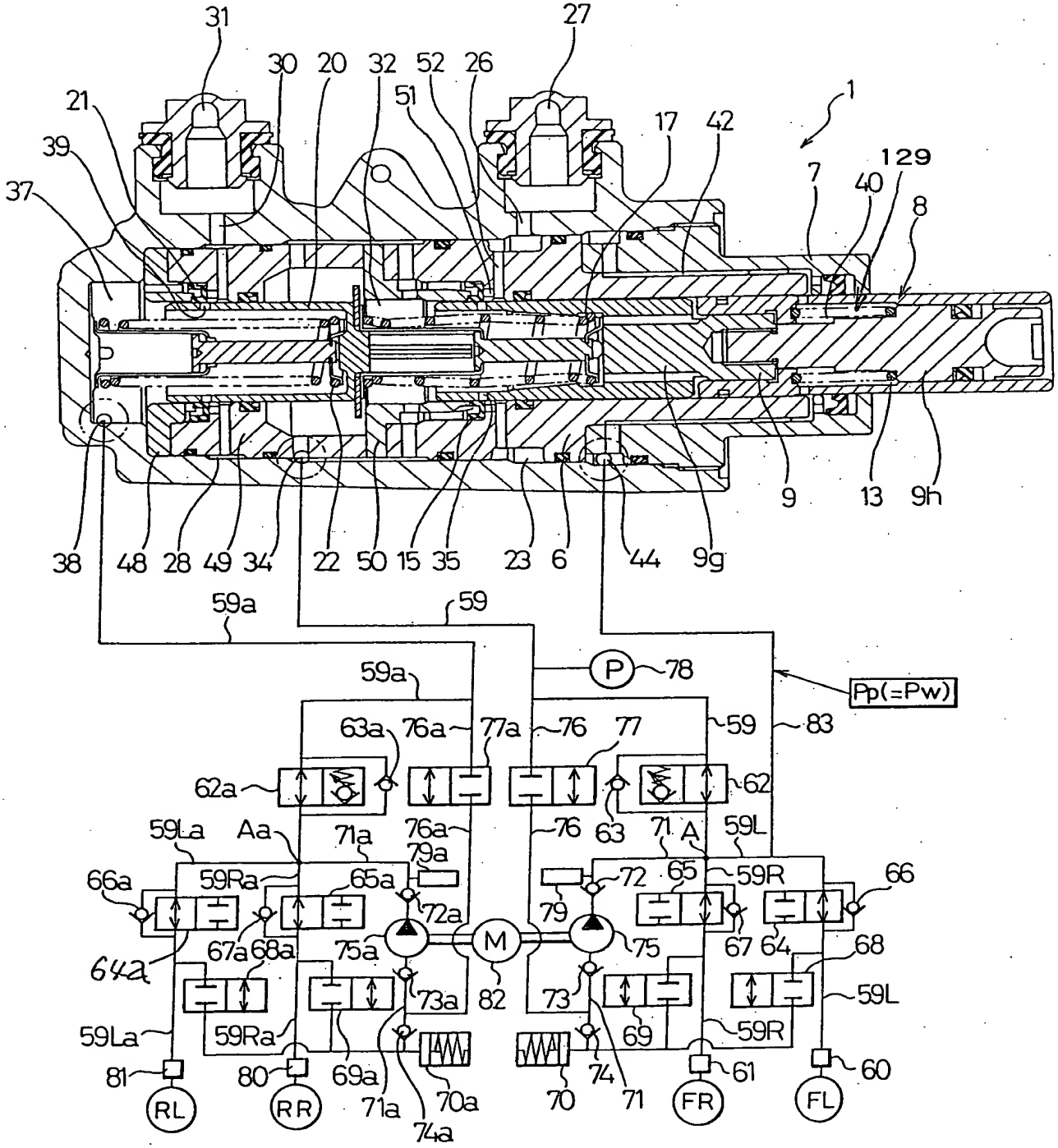

FIG.5

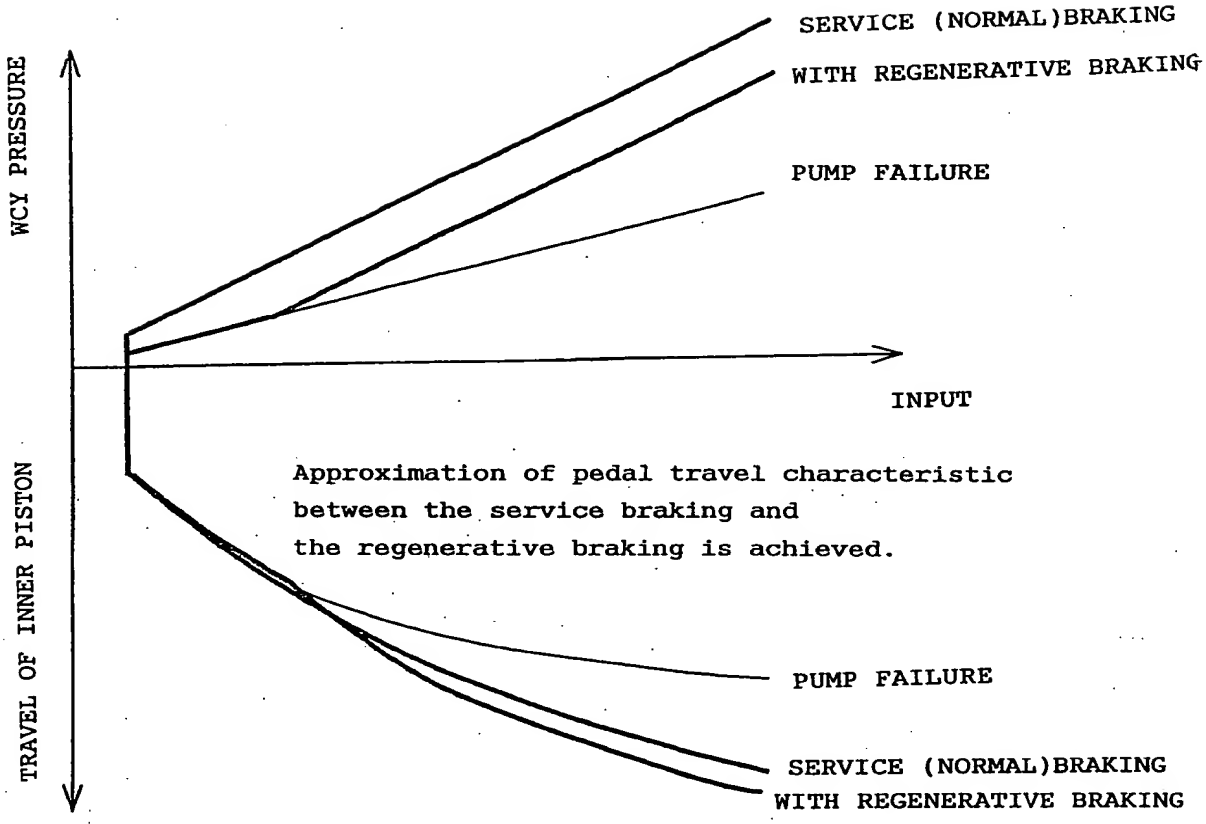
SERVICE (NORMAL)BRAKING
WITH REGENERATIVE BRAKING
PUMP FAILURE
WCY PRESSURE
INPUT
Approximation of pedal travel characteristic
between the service braking and
the regenerative braking is achieved.
TRAVEL OF INNER PISTON
PUMP FAILURE
SERVICE (NORMAL)BRAKING
WITH REGENERATIVE BRAKING

FIG. 6

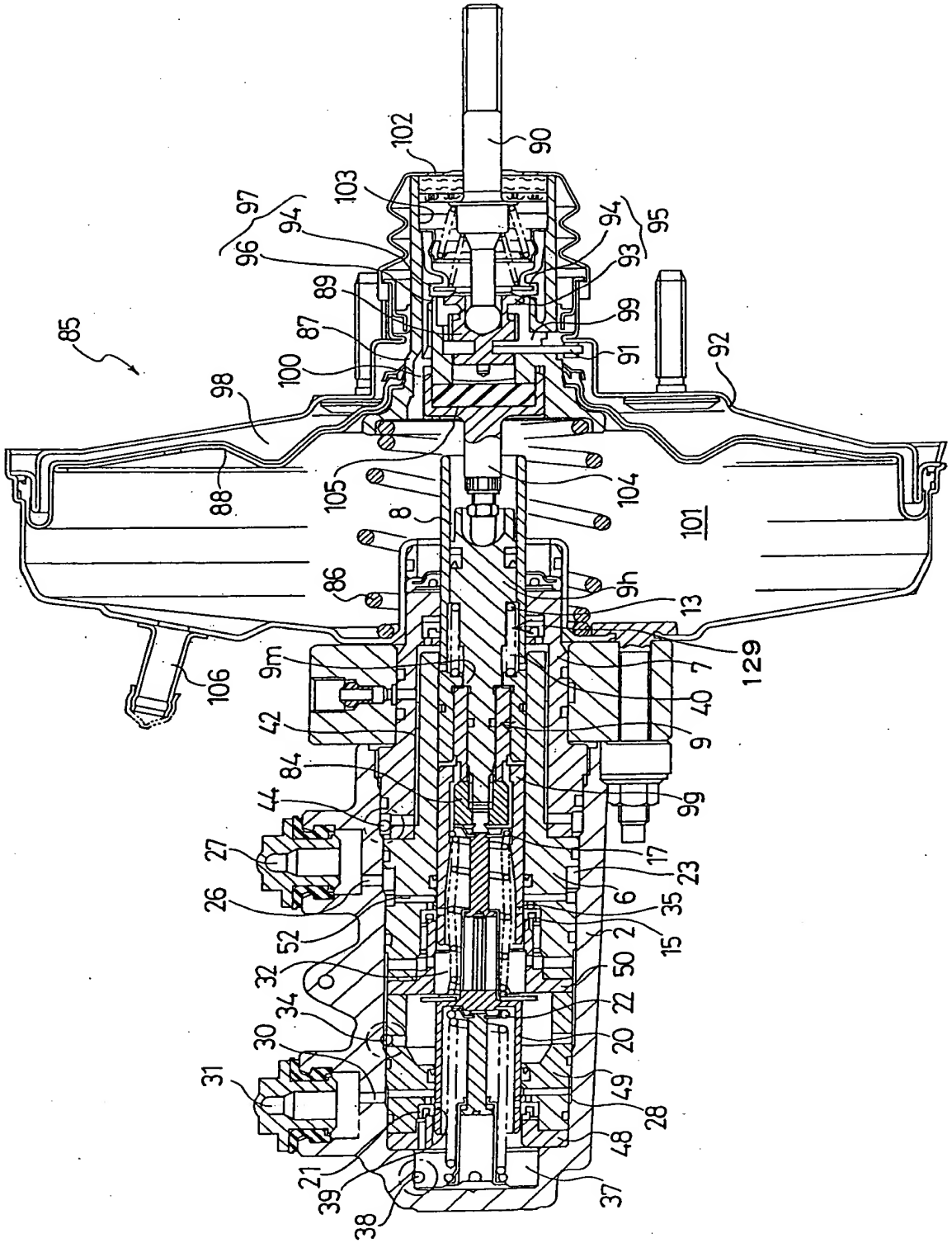
85
88
98
96
97
94
89
87
100
103
102
90
94
95
93
99
91
92
105
104
8
101
86
9h
13
129
106
9m
42
84
44
27
26
52
32
34
30
31
21
39
38
37
48
28
49
20
22
50
2
15
35
6
23
17
99
9
40
7

FIG. 7

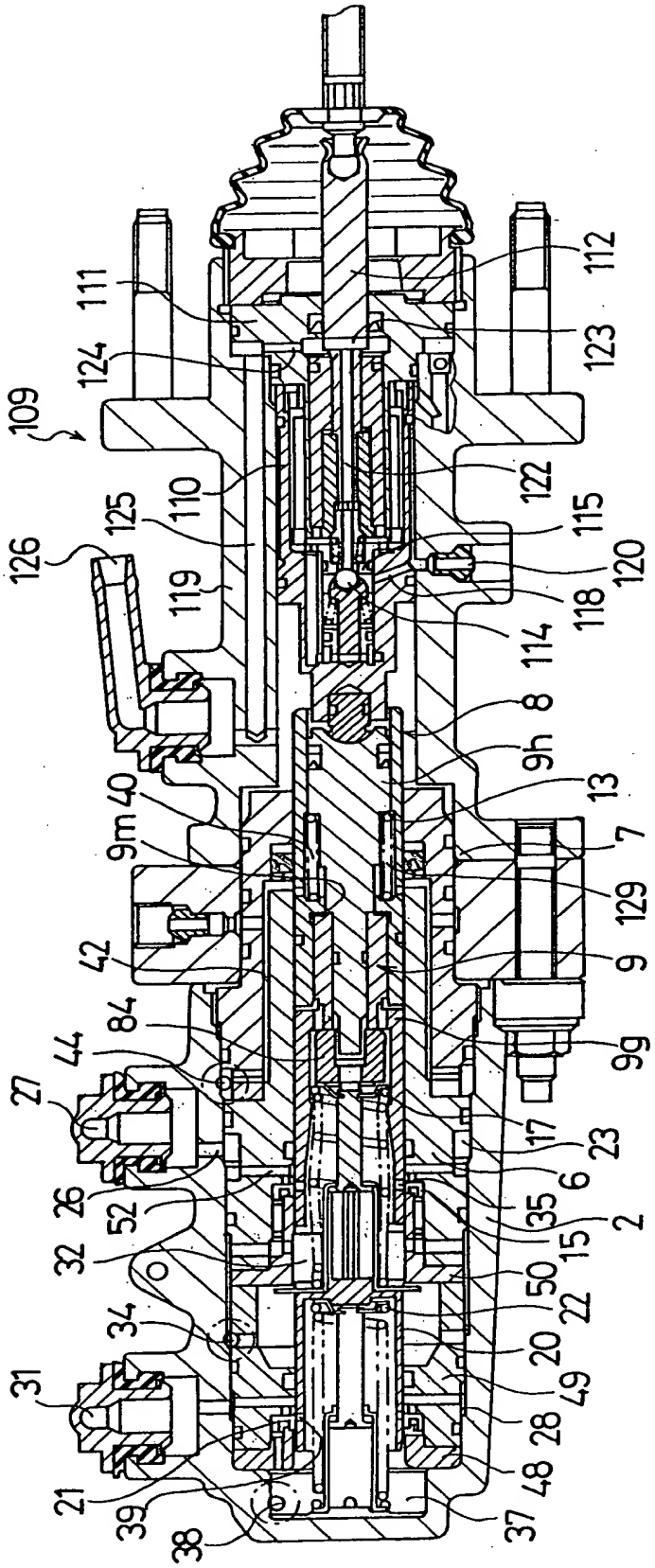
109
111
112
123
124
122
110
125
115
126
120
119
118
114
8
9h
13
40
9m
7
129
9
42
84
9g
44
27
17
23
6
26
52
35
2
32
15
50
22
34
20
49
31
28
48
21
39
38
37

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FIG.8

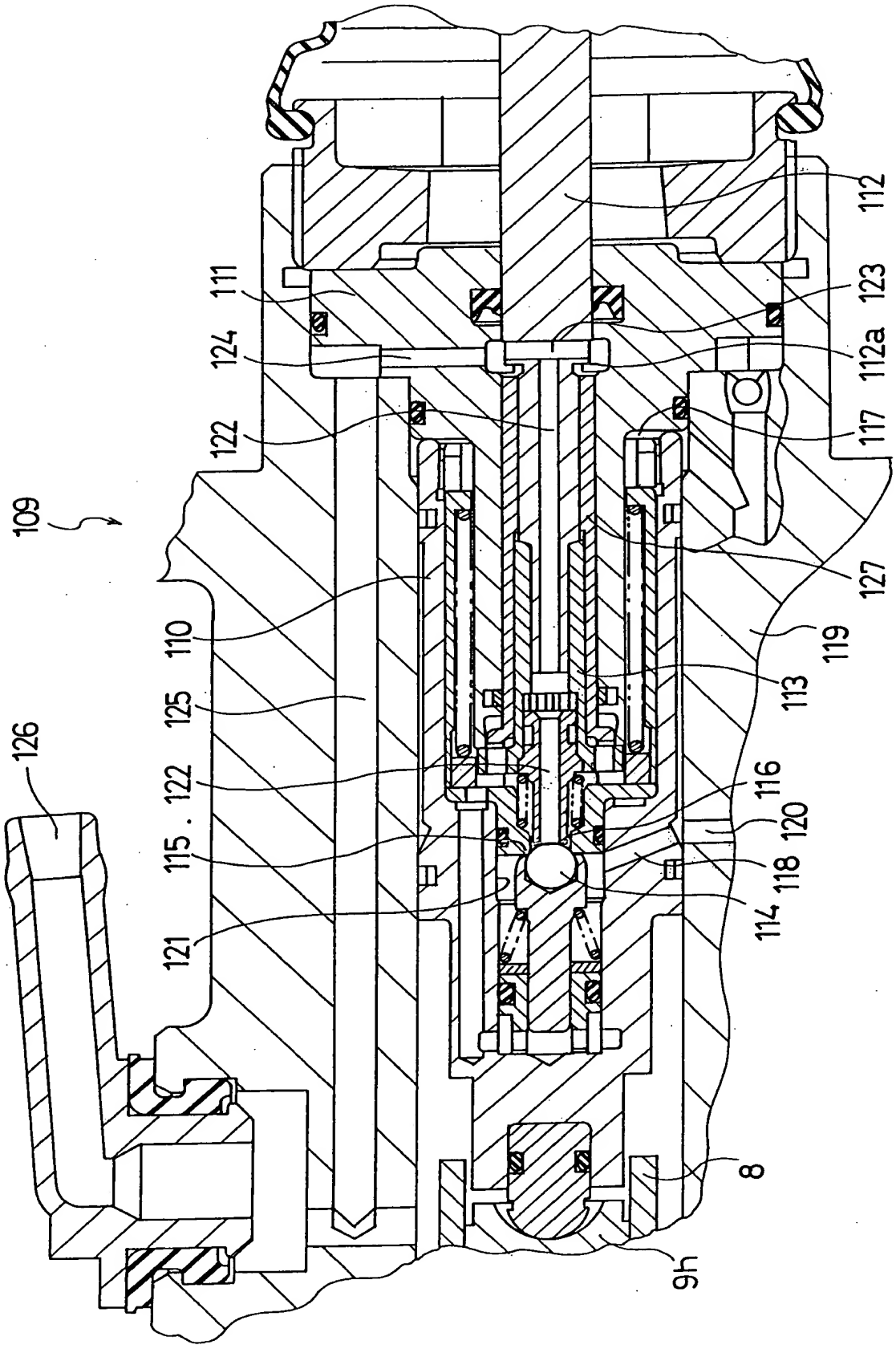


FIG. 9

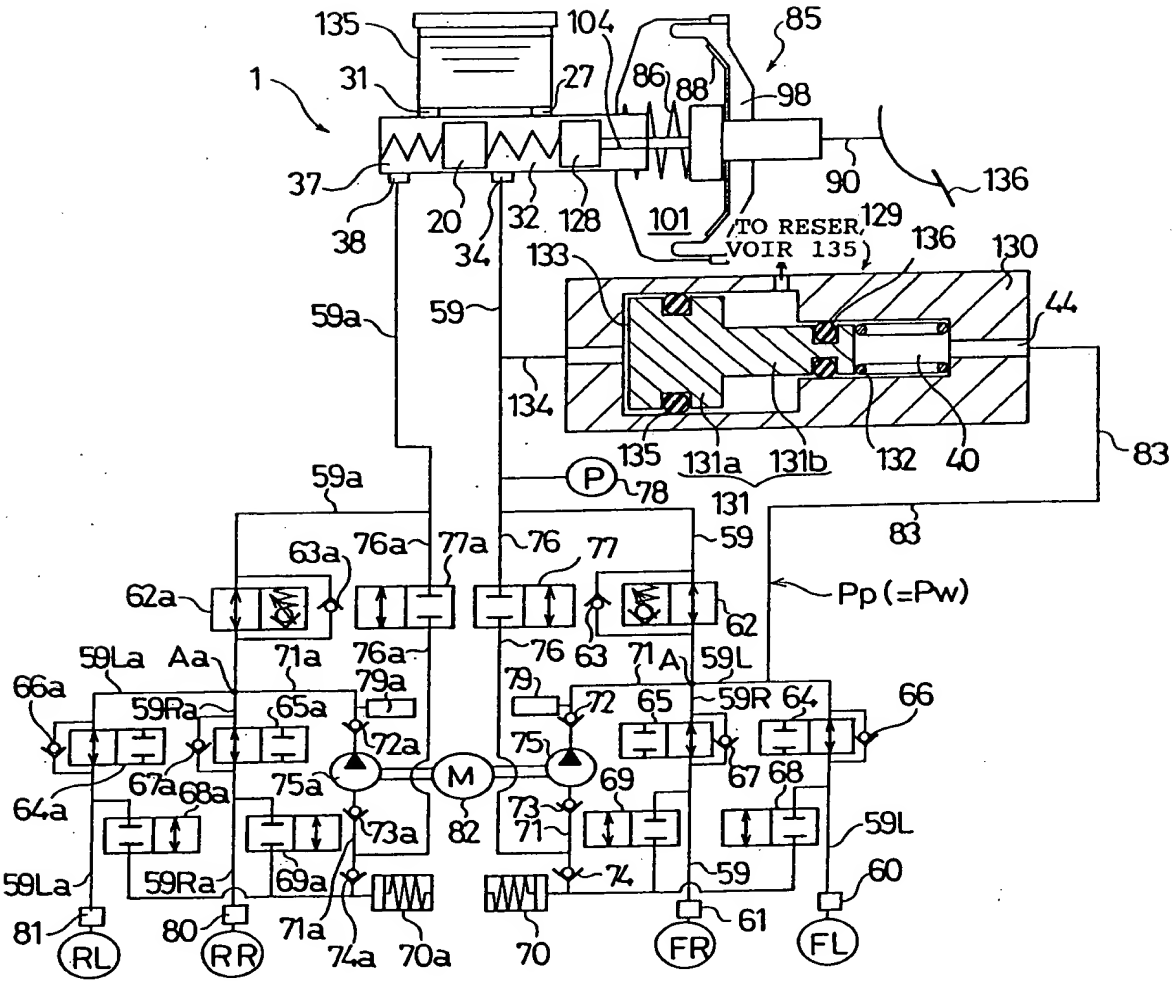

135
104
85
1
31
27
86
88
98
37
90
136
38
20
32
128
101
TO RESERVOIR 135
129
136
130
34
133
59a
59
44
134
135
131a
131b
132
40
83
P
78
131
59a
63a
76a
77a
76
77
59
83
62a
Pp (=Pw)
62
59La
Aa
71a
76a
63
71A
59L
66a
59Ra
65a
79a
79
72
65
59R
64
66
72a
75
67a
68a
75a
M
69
67
68
64a
73
71
73a
82
59L
59La
59Ra
69a
74
59
60
81
80
71a
74a
70a
70
61
RL
RR
FR
FL

FIG. 10

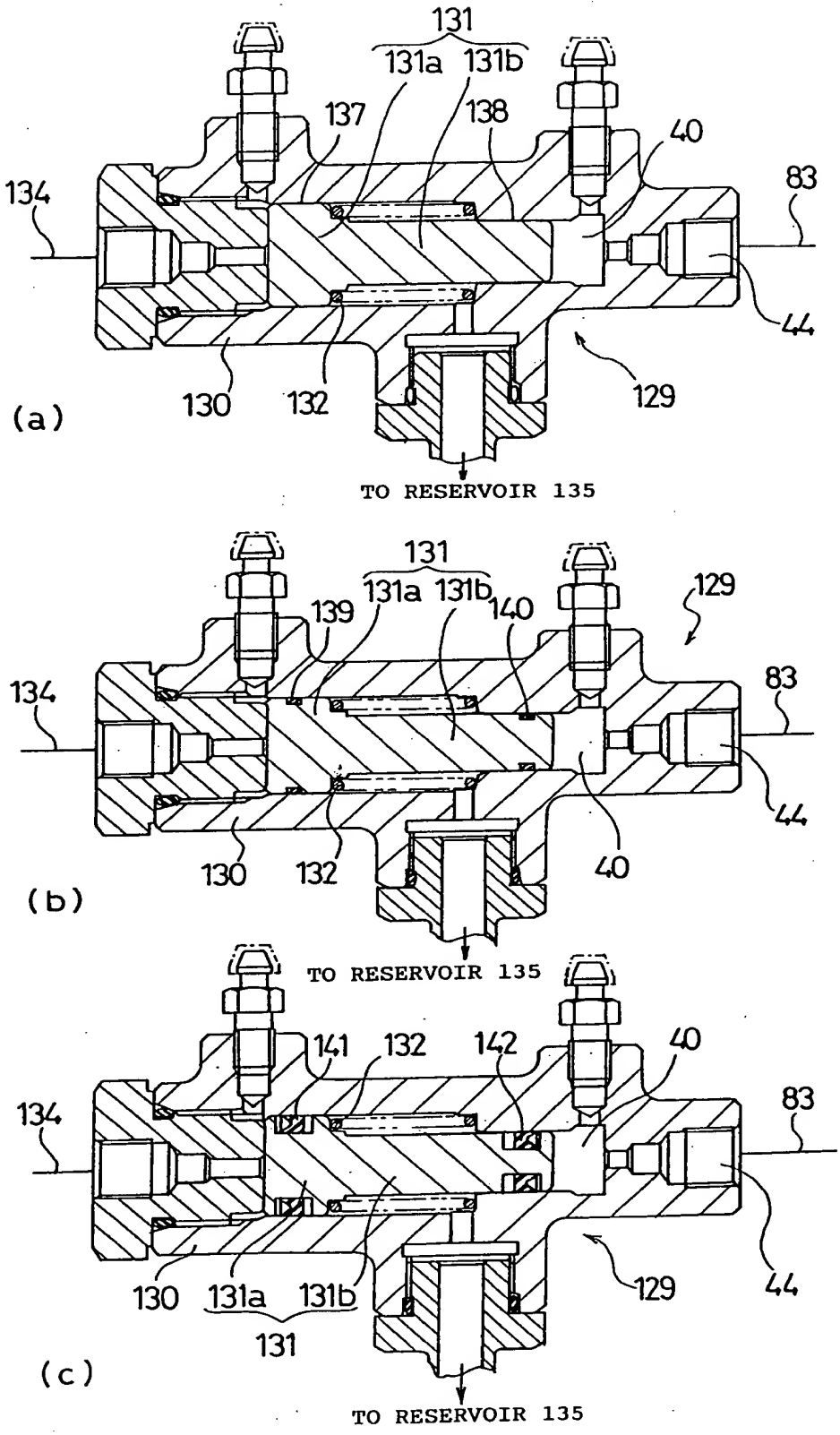

131
131a
131b
137
138
40
134
83
44
130
132
129
(a)
TO RESERVOIR 135
131
131a
131b
139
140
129
134
83
44
130
132
40
(b)
TO RESERVOIR 135
141
132
142
40
134
83
130
131a
131b
131
129
44
(c)
TO RESERVOIR 135

FIG. 11

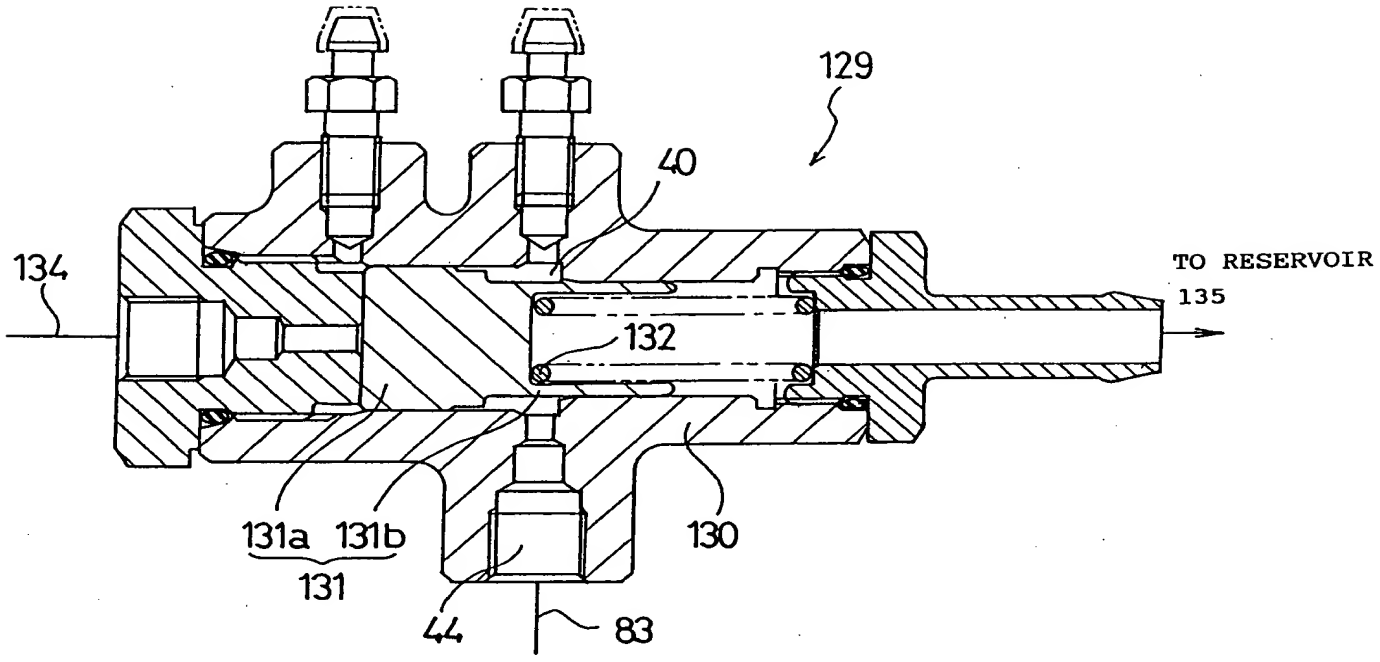


FIG. 12

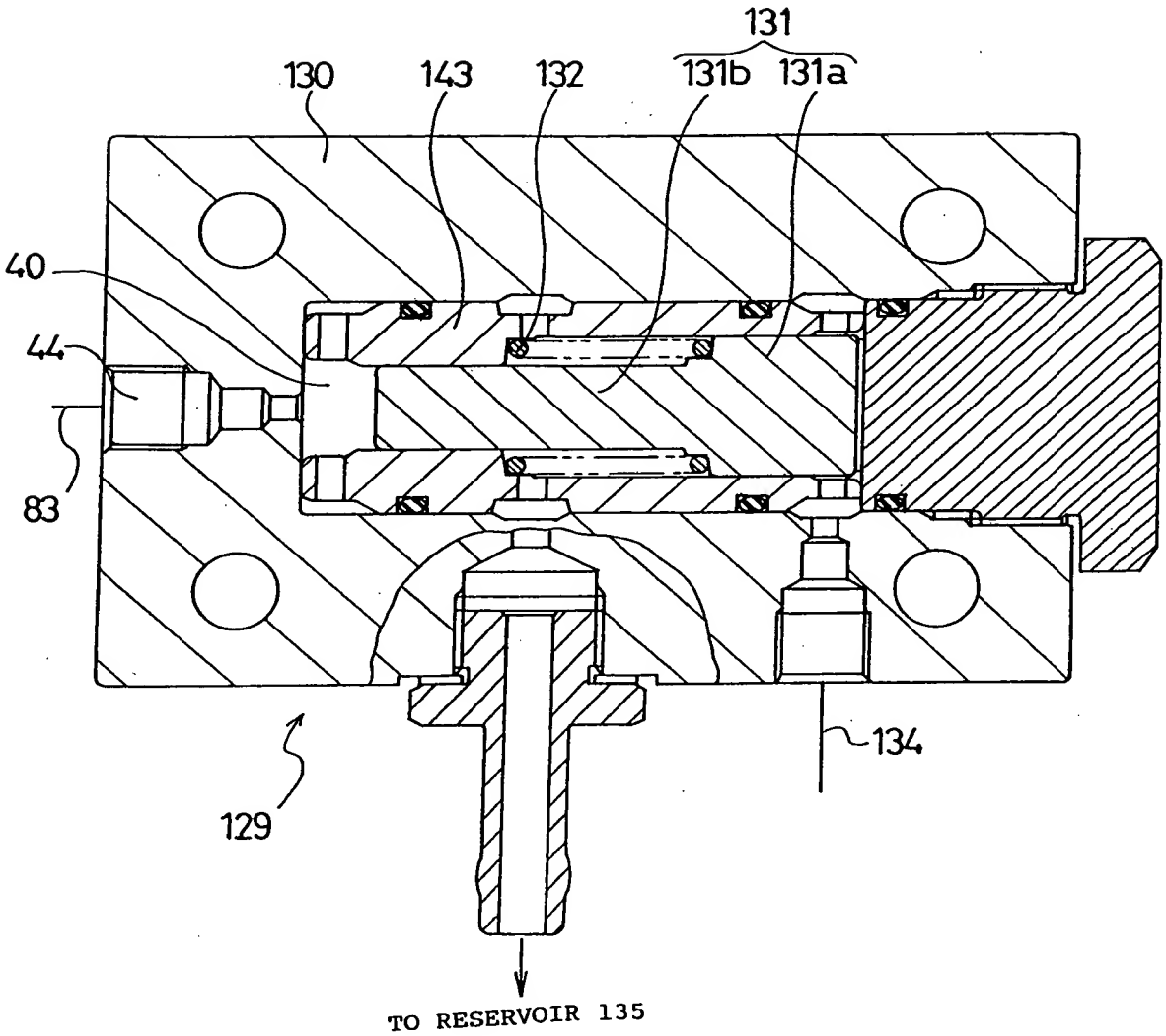


FIG. 13

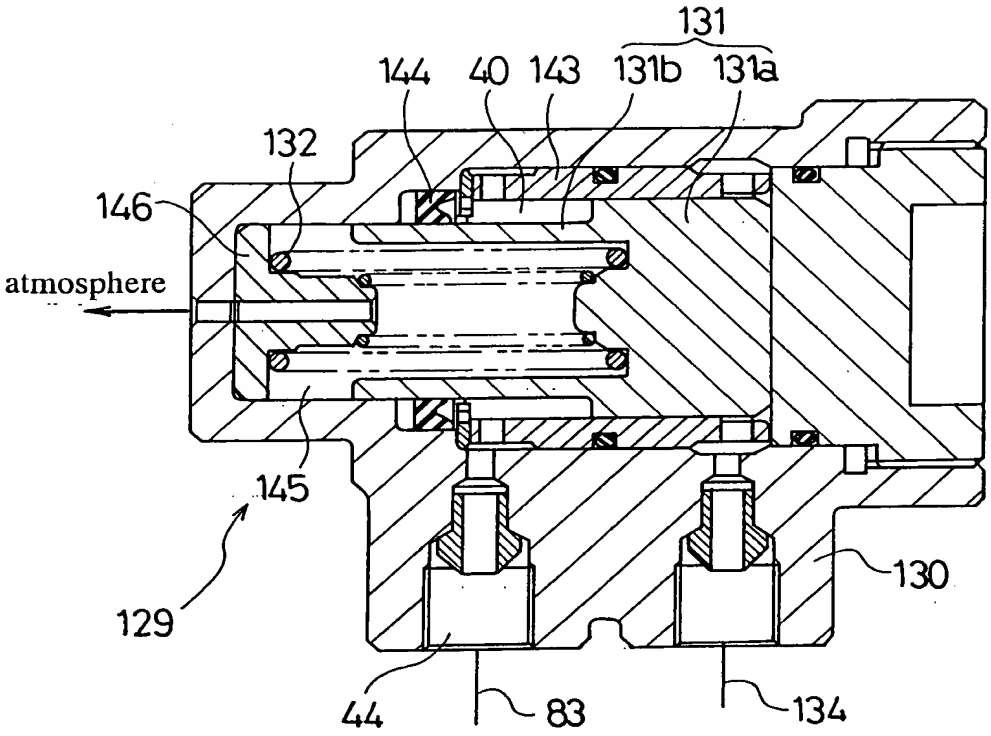

131
144
40
143
131b
131a
132
146
atmosphere
145
129
130
44
83
134

FIG. 14

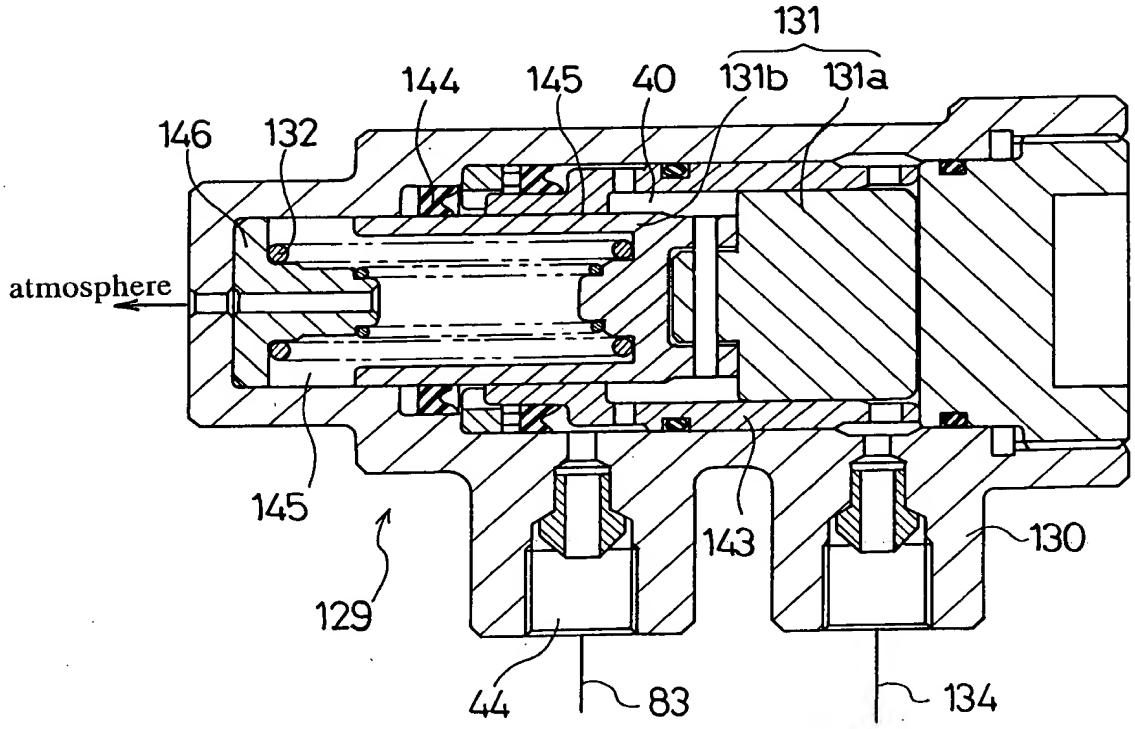

131
144
145
40
131b
131a
146
132
atmosphere
145
143
130
129
44
83
134

FIG. 15

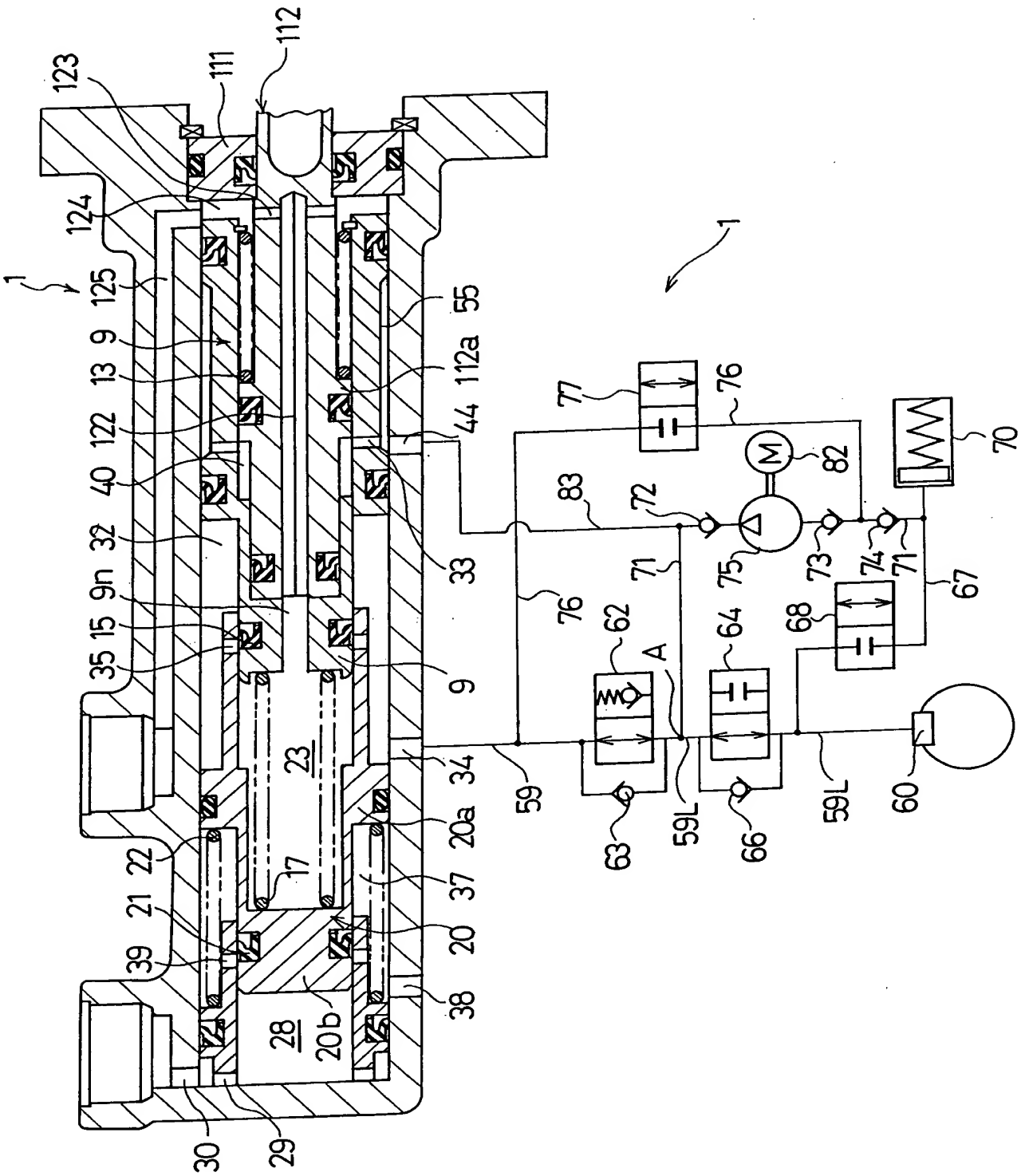

1
123
111
112
124
125
9
13
122
40
32
9n
15
35
55
112a
44
33
9
34
20a
37
20
38
23
28
20b
22
21
39
17
30
29
77
76
82
M
83
72
75
73
74
71
70
67
68
64
62
A
63
66
59
59L
60

FIG. 16

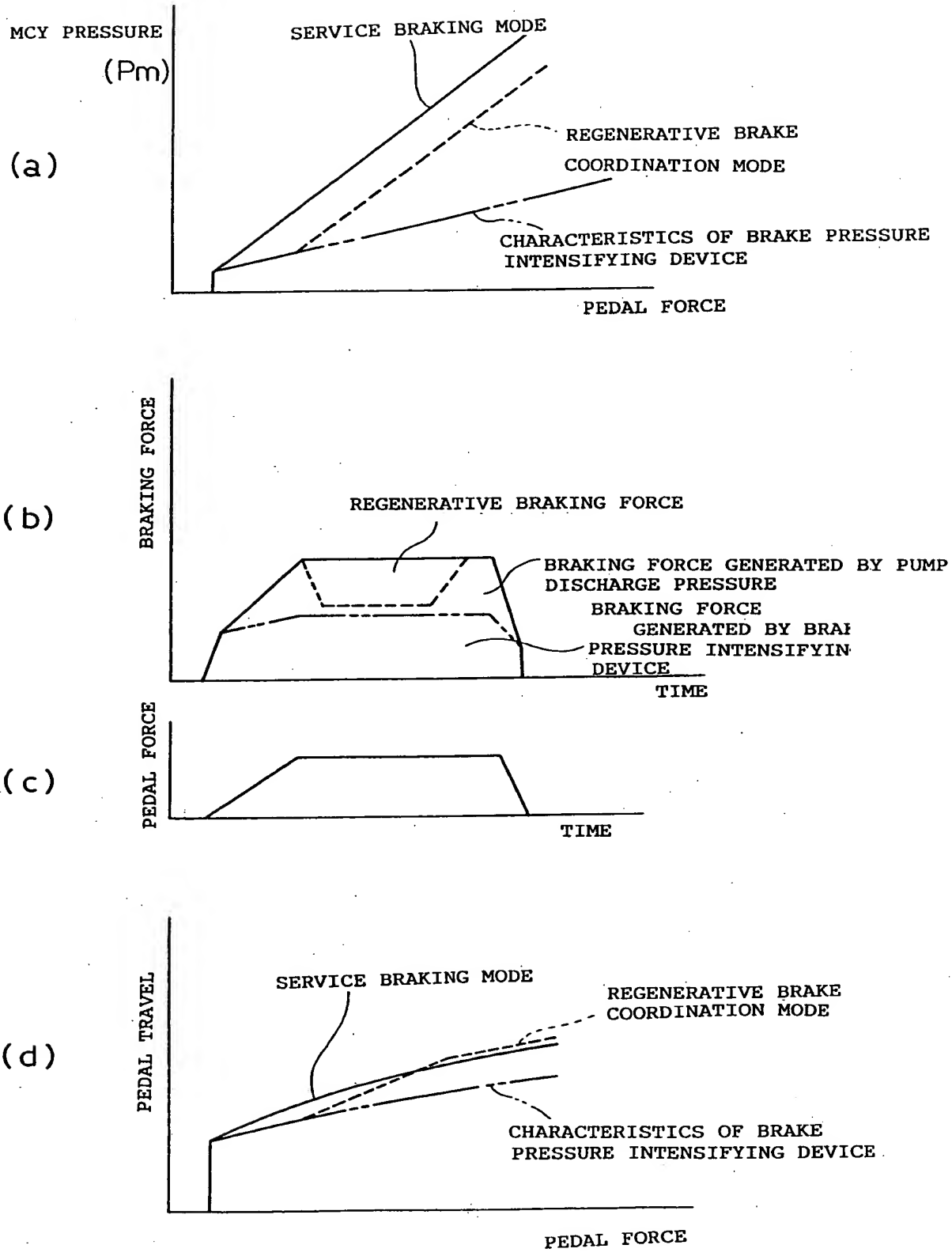

MCY PRESSURE
(Pm)
(a)
SERVICE BRAKING MODE
REGENERATIVE BRAKE
COORDINATION MODE
CHARACTERISTICS OF BRAKE PRESSURE
INTENSIFYING DEVICE
PEDAL FORCE
(b)
BRAKING FORCE
REGENERATIVE BRAKING FORCE
BRAKING FORCE GENERATED BY PUMP
DISCHARGE PRESSURE
BRAKING FORCE
GENERATED BY BRA
PRESSURE INTENSIFYIN
DEVICE
TIME
(c)
PEDAL FORCE
TIME
(d)
PEDAL TRAVEL
SERVICE BRAKING MODE
REGENERATIVE BRAKE
COORDINATION MODE
CHARACTERISTICS OF BRAKE
PRESSURE INTENSIFYING DEVICE
PEDAL FORCE

FIG. 17

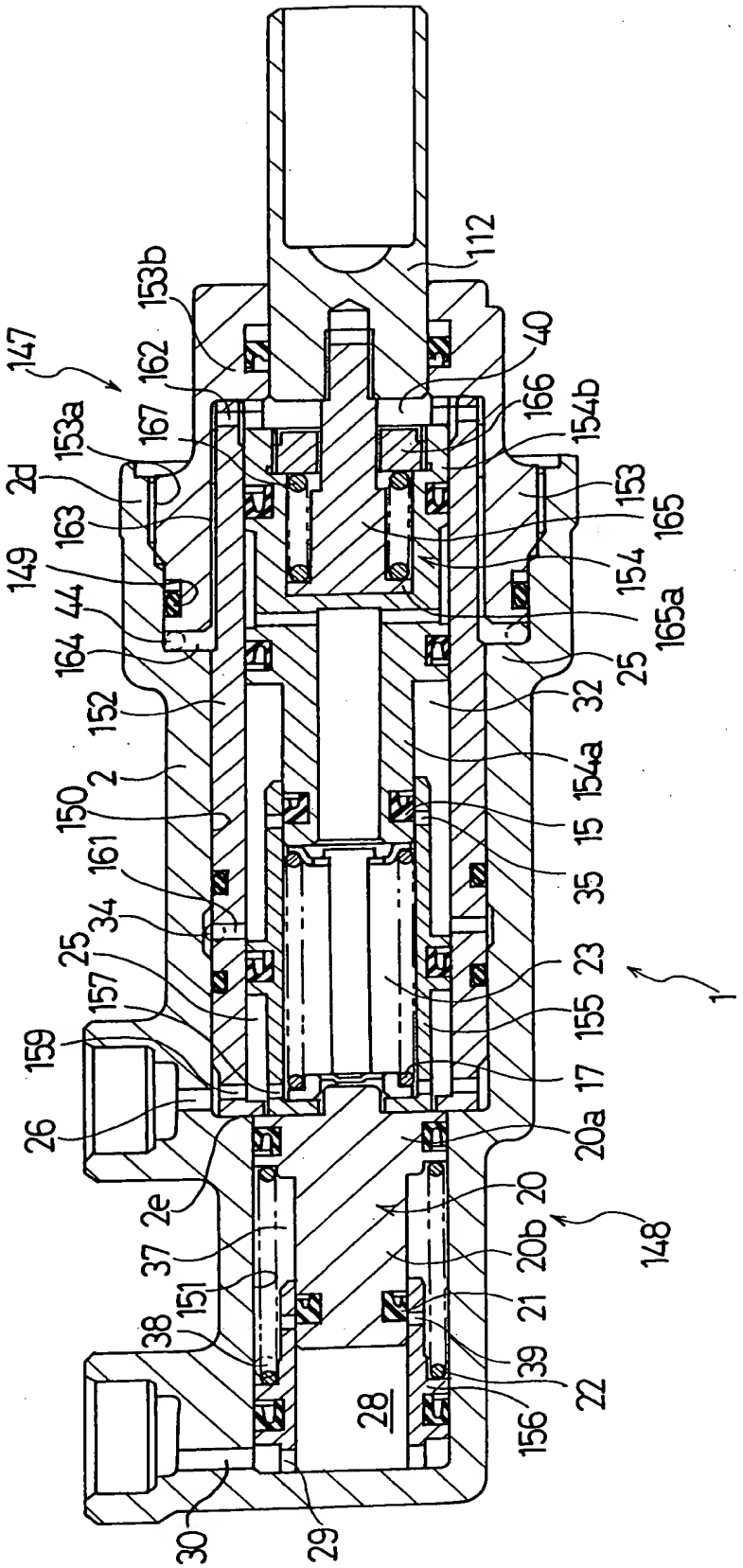
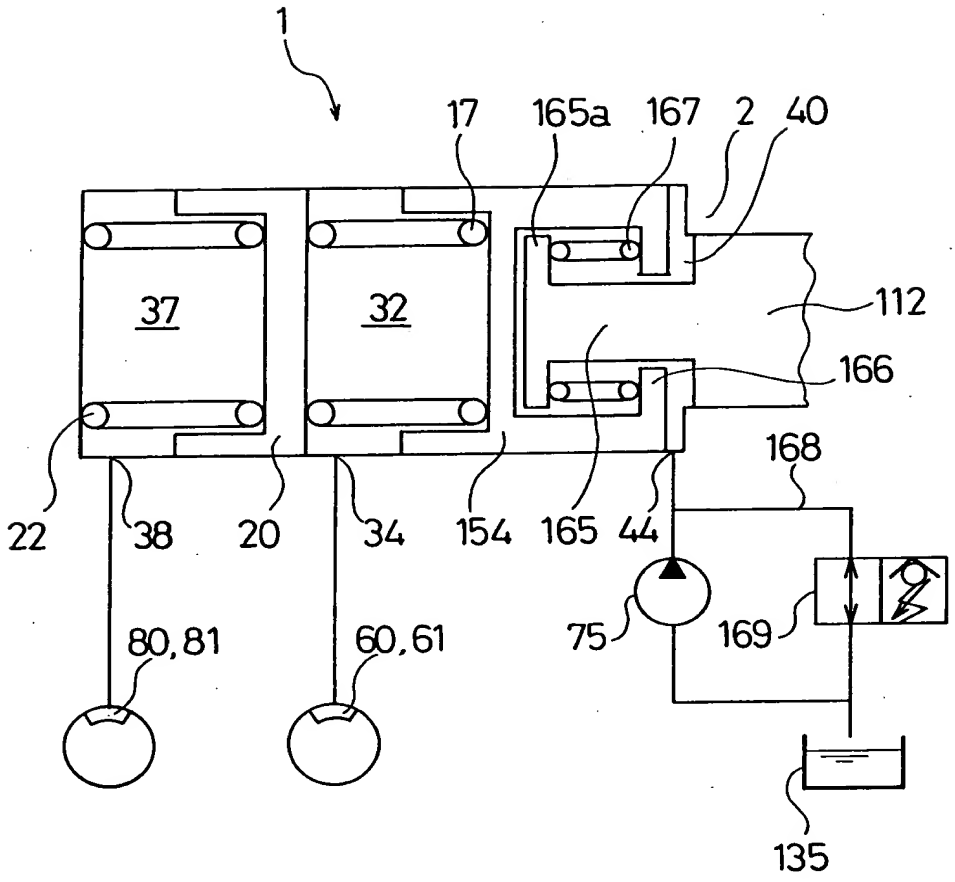

112
153b
147
162
40
167
166
153a
154b
2d
153
163
165
149
154
44
165a
164
25
152
32
2
154a
150
15
161
35
34
25
23
157
1
155
159
17
26
20a
2e
20
37
20b
148
151
21
38
39
22
28
156
30
29

FIG. 18


1
17
165a
167
2
40
37
32
112
166
168
22
38
20
34
154
165
44
75
169
80, 81
60, 61
135